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Route To:

Subject: Bark Beetle Activity on the Santa Catalina Mountains (santacatalinard)

To: District Ranger, Santa Catalina RD

On September 19, 2003, I met with Bill Hart, Forester, Santa Catalina RD, Coronado NF, to assess bark beetle activity at various sites on Mt. Lemmon. In this report, I summarize bark beetle activity and discussions at each site and make recommendations of slash management strategies that might be appropriate given the current level of bark beetle-related tree mortality and fuels reduction treatments.

Bark beetle activity on Mt. Lemmon, Santa Catalina RD

Aerial detection surveys conducted by our Forest Health Protection staff in 2002 found patches of ponderosa pine and Douglas-fir mortality on Mt. Lemmon. The roundhead pine beetle (*Dendroctonus adjunctus*) and pine engraver beetles (*Ips* species) have been associated with much of the ponderosa pine mortality. Fire damage and Douglas-fir beetle (*Dendroctonus pseudotsugae)* are causing the Douglas-fir mortality. Because of the Aspen fire no aerial surveys were done on Mt. Lemmon in 2003, however ground observations suggest both pine and Douglas-fir mortality are continuing on the mountain.

Bark beetle activity in developed recreation and administrative sites

Our first stop was at the Aspen vista where we viewed mixed conifer stands in Carter Canyon and adjacent to Marshell Peak. There was Douglas-fir mortality occurring and could be associated with the Douglas-fir beetle, although we did not visit the trees to confirm the cause of mortality (Figure 1). The Douglas-fir beetle (DFB) infests and kills Douglas-fir throughout most of its range. Douglas-fir beetle normally kill small groups of trees, but during outbreaks 100 tree groups are not uncommon. Losses can be devastating during periodic outbreaks, which typically last only 2-4 years. Those of longest duration coincide with periods of drought. At low or endemic levels, the beetle infests scattered trees, including windfalls and trees injured by fire-scorch, defoliation or root disease. Where such susceptible trees are abundant, once they have been infested and killed, beetle populations can build up rapidly and spread to adjacent green, standing trees. Damage is greatest in dense stands of mature Douglas-fir (Schmitz & Gibson, 1996).

Figure 1. *Pockets of Douglas-fir mortality, possibly attributed to the Douglas-fir beetle, adjacent to Marshell Peak, Santa Catelina RD, Coronado NF.*

The second stop was to examine a recently lightening struck ponderosa pine that had fallen. There was evidence of boring dust on the main stem and after removing portions of bark, beetle galleries were found which indicated successful colonization of the tree by pine engraver beetle. The pine engraver is one of the most common and widely distributed bark beetles in North America. In most years, the pine engraver is not an aggressive tree killer, even though large populations commonly infest logging slash, windthrown trees, or trees broken by wind or snow. When populations are low, the beetle may kill or top-kill widely scattered single trees or small groups. In outbreak years they may kill groups of 50 to more than 500 trees. Larger trees are often top-killed with the lower bole uninfested or colonized by other species of bark beetles or wood bores (Kegley et al., 1997).

The next stop was the Loma Linda/Sabino project area. The project treatments were being implemented during our visit. Treatments included thinning, piling and burning. Some of the piled ponderosa pine material was being attacked by *Ips* bark beetles. We also observed piles that were being attacked immediately adjacent to standing residual host trees (Figure 2).

Our last stop was at the Steward Observatory and radar station above the Mt. Lemmon ski area. We were checking for signs of Douglas-fir beetle activity in adjacent Douglas-fir stands. A recent fire in the area had severely scorched several Douglas-fir trees. These trees were losing their needles, however, there were no signs of Douglas-fir beetle activity at the lower portions of the bole.

Figure 2. *Slash piles being attacked by engraver beetles, Loma Linda/Sabino project area, Santa Catalina RD.*

Recommendations

Restoration Projects - The best preventive strategy to minimize future bark beetle activity and associated tree mortality is to implement silvicultural strategies that use an integrated pest management approach. Activities could include thinning to reduce tree densities, removal of infested trees and appropriate slash management. Thinning dense stands of ponderosa pine relieves competitive stress among the residual trees, making them less susceptible to attack. A treatment of thinning from below and brood tree removal to a target basal area of 60-80 ft^2/ac will help to reduce the overall susceptibility of the stand in the long term. Thinning slash should be removed from the site or treated in such a way as to prevent its becoming brood material for *Ips* beetles. This is extremely important to consider while bark beetle populations are at high levels.

Recreation and Administrative Sites - The District is doing a nice job reducing basal areas and lowering site susceptibility to bark beetle attacks in the sites visited. Where tree mortality continues to occur because of adjacent high beetle populations it is recommended that the infested trees be removed or destroyed as soon as possible, such that the brood cannot complete its development and attack adjacent host trees. If infested trees are cut, they must either be removed from the site or, if left should have the bark stripped off, significantly scorched to kill the developing beetle brood, or chipped. If chipping is done while beetles are actively attacking trees, the chips should be removed from the site. Fresh chips can attract beetles that could attack adjacent residual host material. If fresh chips cannot be removed from the site, they should be kept a minimum of ten feet away from the base of residual host trees.

The following are general preventive measures for future fuel reduction/thinning projects. Most of this information is included in the Integrated Pest Management Guide for *Ips* species attacking ponderosa pine (Parker, 1991) and this summary was taken from a site visit letter written by Joel McMillin, September 12, 2003, Springerville RD, A-S NF.

The utilization of large diameter slash is key to minimizing *Ips* activity related to thinning projects. Harvesting most ponderosa pine slash larger than 4 inches in diameter will help to prevent beetle population increases, because few beetles are produced in slash less than 4 inches. The larger diameter slash should be removed from the site or treated (chipped) within 28 days of being generated if thinning occurs during active beetle flight periods (April through the end of September at elevations above 8,000 feet). If thinning occurs during November through March, the larger diameter material should be removed or treated before the time beetles complete their first generation in the spring (i.e., by early May). If slash does become infested in April, removing or treating the newly infested material may aid in reducing the local population of *Ips* beetles.

In general, beetle population increases can be minimized by implementing thinning projects after the onset of the monsoon season (mid-July) through December. Cutting trees during this season will allow the material to partially dry out before beetles fly in the spring. Also, standing residual trees may be less susceptible during this time. Slash generated from January through May remains moist and enhances beetle population increases. While this is a good general recommendation when beetle populations are relatively low, we have observed *Ips* species to complete at least one generation in slash generated during the fall of 2002 on most Forests in Arizona. If this timing approach is being used and trees are only lopped and left on untreated on

the site, there are a couple points to consider. First, slash generated on more exposed areas that have relatively flat land and low residual basal area will likely dry out by the time beetles fly in the spring. Second, on steeper slopes or where the residual basal area is still relatively high, slash may not adequately dry out by the time beetles fly in the spring.

Another general "rule of thumb" approach to preventing *Ips* beetles from impacting areas where thinning projects are being implemented is to separate project areas either in time and/or in space. Beetle populations probably will remain relatively low if projects are conducted every other year. Similarly, a buffer of over two miles between management areas is also thought to prevent mass movement of beetles from one area to another. This scenario somewhat resembles an approach used in the northern Rocky Mountains, where *Ips* populations are regulated through "green chaining." As long as there is new and suitable slash, the beetles stay in this material and do not severely impact thinned stands. However, if the slash food supply is cut-off, the beetles may move into standing trees. I would caution against this approach in Arizona, as there can be numerous factors that may result in the "breaking of the chain."

Also, a word of caution about chipping fresh slash. Although no experimental studies have been conducted to examine the relationship between chipping and bark beetle attraction, we do know that bark beetles are attracted to host tree compounds such as terpenes. Fresh-cut trees and chips release high quantities of terpene volatiles that can attract bark beetles. To minimize the potential of chips attracting bark beetles, chips should be spread out as much as possible in open areas, rather than in shaded areas, or removed from the site. Try to prevent piling the chips at the bases of pine trees. If the chips are spread out in a thin layer and out in the sun, they will dry quickly and, therefore, stop emitting terpene volatiles. Chipping in the fall probably has less risk than chipping at other times of the year.

It is important to understand that the ponderosa pine forests on and adjacent to the Santa Catalina District are posed for continued tree mortality at levels similar as in the past. Increased bark beetle population levels will continue if drought conditions processed.

Douglas-fir mortality - Present management strategies for the DFB emphasize silvicultural practices and/or the use of an anti-aggregation pheromone MCH. Silvicultural activities limit the amount of suitable breeding material. Sanitation/salvage harvests that remove windthrown, fire damaged, root disease or otherwise weakened or injured trees from the forest and proper treatment of logging slash can prevent the buildup of DFB populations. Thinning can reduce the probability that residual trees will become infested. MCH treatments can effectively protect stands by preventing beetles from initiating new attacks. Beetles will move through a treated area and continue to disperse until they find suitable habitat elsewhere or unit they die. MCH comes in a bubble capsule that can be stapled to a tree. It is most effective when applied before beetles begin to fly and attack trees in the spring.

I would recommend the District continue to monitor the Douglas-fir sites of concern. If there are resources that are being negatively impacted by the DFB we can evaluate individual sites using risk rating models and provide information that could facilitate decision making regarding management of Douglas-fir stands to reduce potential mortality.

If you have any questions regarding my assessment of current bark beetle activities on the District, its potential effect on residual standing trees, or my recommendations, please let me know. I can be reached at (928) 556-2073 or janhold@fs.fed.us.

/s/ John Anhold
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